POPULAR MECHANICS

An Illustrated Weekly Review of the Mechanical Press of the World

"Tells you how to do things." Written so you can understand it.

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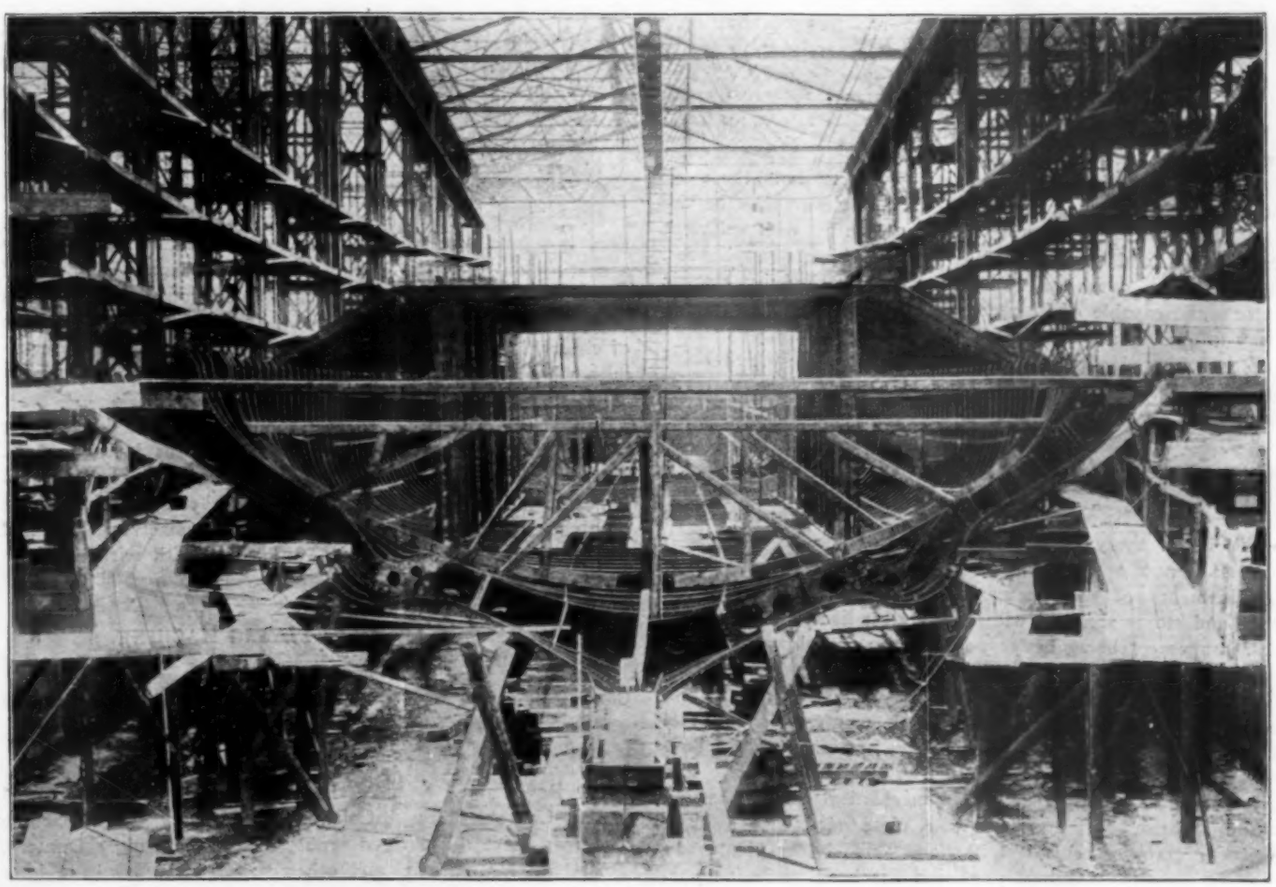
Building Krupp Battleships Under Glass Roof



One of the Great Slips of the Late Cannon King Covered with Glass so that Work May be Rushed Regardless of Weather

IN THIS ISSUE:

Great Shipyards Controlled by the Krupps.
Krupp, the Cannon King, a Peacemaker.
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Machine for Making Snow Storms.

GERMAN SHIP YARDS FORGING TO THE FRONT.

Emperor William Will Build his New Navy at Home.

A country with small coast lines and no colonies does not expect to do much fighting at sea in time of war, and hence requires a small navy. With the retirement of Bismarck Germany began to seek new colonies and build a navy which, in 1920, will include a great fleet: 38 battleships, 20 large cruisers, 45 other cruisers, and scores of torpedo boats and destroyers.

The new navy law of 1900 has infused great activity in German ship-building industries which have increased from seven in 1870 to thirty-seven in 1900, and since then to ninety establishments.

The vast ship-building works at Kiel recently passed into the hands of the late Herr Krupp, the celebrated gun maker. The Kiel works are detailed in Page's Magazine, London, as follows:

The large building slips are the most important features of the new establishment. Of these ten are planned, but only seven have so far been built. Their length is from from 377 ft. to 640 ft., with a breadth of from 85 ft. 4 in. to 98 ft. 6 in. The three others will be still larger, one being intended to have a length of 836 ft. These slips are built of concrete with granite walls, and are closed by pontoons. Four of them are completely covered with glass roofs and sides, so that the work can go on in advantageous conditions, whatever may be the state of the wind or weather. They are lofty, with sufficient head room, and are provided with the latest appliances. Each has two overhead traveling cranes worked by electric motors, and capable of lifting six tons. They can thus convey heavy fittings to any part of the ships in hand. It is expected that the covered slips will enable the period in which ships remain in hand to be shortened, and there will be material advantage in vessels being constructed under cover from the weather. It is intended that the other docks will be covered in the same way. A large building slip, on which five or six torpedo boats of from 400 to 500 tons can be built, has also been laid out; it is of special character, with an unbroken slope carried below the water level.

Work is now actively in progress upon completing the new establishments of the Germania Yard. The various forges, shops and stores are, and will be, closely adjacent to the slips, the arrangement being better even than in the old yard. There are smithies, with zincing plants, a fitting shop, a frame-bending floor, a drawing loft, an angle iron shop, a saw mill and carpentry shop, a joinery and painters' shop, tool shop, iron and metal foundry, model-making shop, boiler shops for cylindrical and water-tube boilers, and various forges, a copper smithy, a mechanical shop, a testing station for machines and boilers, a plate yard with a great cantilever crane, a central station and three boiler plants. In planning the new buildings provision has been made for possible extensions in the future. At present the works dispose of 914 machine tools and other machinery, 10 steam hammers of great power, 72 cranes of which one on the wharf will lift as much as 150 tons and has a great overhang, and 260 dynamos and electro-motors. The railway and the narrow line in the yard offer great facilities for the conducting of work. The yard has a very extensive electric plant, providing power and the current for 450 arc lamps and 4,400 incandescent lamps. There is also a complete telephonic equipment; and indeed it may be said that in all respects the Germania yard is well abreast of the time, and fitted with the latest apparatus and every facility. The total number of workmen employed is at the present time about 4,000, but when all the new constructions so far planned are in working order employment will be given to about 7,000.

The coal operators don't seem to like the people that are working for them.

HOW AND WHERE COW-BELLS ARE MADE.

Little Town in Connecticut Produces the Supply for Nearly the Entire Country.

Cow-bells that melodiously chime on the western plains, sheep-bells that dingle on the big American sheep ranches, bells for grazing horses and mules and all kinds of bells for the farm and ranch are nearly all made in one factory, which stands on a hillside street in the little town of Collinsville, Conn. The factory turns out from 10,000 to 15,000 bells every year, and they are shipped to all parts of the country through the wholesale hardware houses. To several great cattle ranches of the West were sent recently a lot of the bells tuned in sets of an octave each, so that the bell bearers among the shifting herds answered each other in musical chime. Ranchmen say that bells echoing in tunes across the plains deter wolves from attacking the herds.

The metal for the bells is received at the factory in large flat sheets of thin iron, direct from the rolling mill and is passed under a steam-driven cutter which turns out the properly shaped pieces like paterns for a double-bladed axe. Then a ring for a clapper is fastened into the center of each piece and it is spanned with a little iron strap for a handle.

Finally the piece is bent down into the familiar bell shape, and its sides riveted together on the anvil. The bell is in shape then but it still lacks tone and color. These are gained by a coating of brass and a bath in a fiery furnace. In nests of four or five each the bells, ranging in size from the little 3-inch sheep-bells to the 7-inch cow-bells, are placed with a mixture of charcoal and brass filings between them, in plumbago crucibles whose lids are held in place by a plastering of wet clay. Then these are immersed in the fire.

Within the crucibles the brass spends itself in a thin coating over the imprisoned bells and the bell obtains its clear note. All that need be done afterward is to burnish the bells, which is done by throwing them with a few leather scraps into a big revolving cylinder in which they polish themselves. The bell tongues are made in foundries, and come with wire attached, ready to bend on.

FATHER LEPORE'S FLYING MACHINE.

Competitor for the Mettz Prize Builds a Ship on the Plan of the Eagle.

The Rev. Father Felix M. Lepore, pastor of the Mt. Carmel Italian Church, Denver, Colo., has invented a flying machine that may solve the mooted problem at which Santos Dumont, Tesla, Stanley Spencer and other noted inventors have long been expending their best efforts. It is stated that eastern capitalists have thought so much of his contrivance that they have advanced $20,000 for completing its construction.

Father Lepore is one of the three inventors who were permitted to enter the contest for the prize of $250,000 offered by Mettz of London, England, for the airship which gives the best results. Santos Dumont has been named as another but the name of the third has not been made public. Father Lepore said:

"There is no doubt of the machine's success. When completed it will be as easy for me to fly to New York as to walk to town. The propelling power is the great secret of it all. The machine will be arranged on the plan of a bird. When an eagle comes in contact with a fierce current of air it does not battle against it, but closes its wings and with beak pointing downward, cuts through the wind area. In my machine the propeller can be either lengthened or shortened at the will of the operator."

Manual Training School Boys at Play

A CRITICAL MOMENT IN THE WRESTLING MATCH

In manual training schools as well as in other colleges, wrestling is becoming a popular pastime among the young men students. The accompanying illustration shows a group of students watching an exciting wrestling match during the noon hour at a St. Louis school. It is a "catch as catch can" match. The photograph was taken by George Stark at a critical moment when the more agile yet less muscular of the contestants has caught himself on his hands to keep from being downed. It will doubtless surprise the reader to learn that the youth with his feet in the air regained his equilibrium and downed his opponent before the match was ended.

MACHINE FOR LOADING SUGAR CANE.

A sugan cane loading machine which will load 20 tons a day has been invented by a negro—P. J. Howard of St. Gabriel, La. The device consists of a large frame of iron and wood on four wheels, which is drawn by two horses. The wheels straddle a row of cane. Extending out on each side the frame has attached to it two arms, which work on pulleys, and at the end of these there are clutches, which pick up these bundles of cane from the ground after it has been cut and piled. This is done by the clutch sliding under the pile of cane and gripping it, when it is held by a chain that fits in a catch. At the rear is an arrangement to which two mules are attached by singletrees, so that when they move away they draw on a rope over a pulley, which lifts the cane up and carries it around to the side, where it is held over the waiting cart until the clutch is loosened, and it falls into the cart. One cart is loaded on each side of the machine at the same time. As fast as a bundle is loaded the mules attached to the machine are driven forward until the machine receives another bundle on each side and deposits it in the cart.

Water expands one-twelfth of its bulk in freezing, exerting a pressure of 30,000 pounds per square inch. Air is 813.67 times lighter than water at sea level.

HOTEL UNDER THE SEA.

Near Perdum, on the south coast of France, there is a submarine hotel, which attracts large numbers of visitors every summer. The building is of steel on concrete foundation, says the Hotel World, and has been fitted with large plate glass windows, from which the guests may look upon the beauties of submarine life at a depth of six fathoms. Elaborate machinery at the surface pumps sea air to those immured below and at the same time drives away the impure air through draught tubes. It was in this hotel that the famous novelist Richebourg penned some of his most thrilling romances when taking his annual flight from the bustle and noise of the French capital.

A pipe inserted in the top of a stack, leaving an annular space of 3 inches between itself and the inside of the stack, extending about 8 feet down into the stack and projecting 7 feet above it, is said to be an excellent and cheap device for preventing smoke and a saver of 10 per cent of fuel.

To solder a piece of carbon and a piece of brass together, copper the carbon with a battery, then attach the brass with soft solder.

OCEAN PALACES SOLD FOR SCRAP.

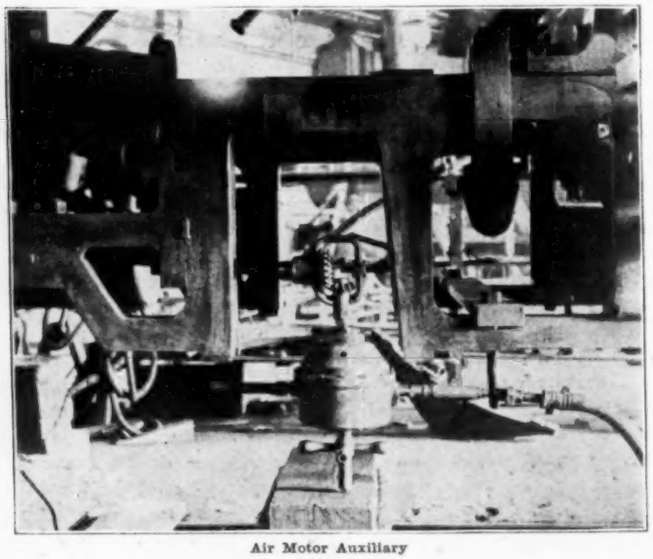
Vessels that Cost Millions Twenty Years Ago Now Sold for a Few Thousand Dollars.

Two weeks ago Popular Mechanics told of a small sailing craft, worth a few hundred dollars, which was still in service after 150 years of use. The modern ocean passenger steamer is retired at the end of twenty or thirty years. The Marine Journal says: The steamship City of Rome, which was launched in June, 1881, is to be broken up. She was to become the property of the Inman line if she came up to the contract in speed, etc. She failed and was afterward put in the Anchor line, where she was only partially successful. This vessel cost originally $1,500,000. Her sale to a firm of German ship breakers was consummated at $87,500. The City of Rome is now twenty-one years old, and many of the ships built that long ago have disappeared. The City of Richmond of the old Inman line, built in 1873, was nineteen years afterward sold for $40,000 to be broken up. The Guion liner Alaska was also sold to ship breakers eighteen years after she was built. The Cunard steamers Catalonia and Pavonia had both seen eighteen years' service when they were sent to the scrap heap, which goes to show that North Atlantic liners in the past have many of them ended their days in a little short of twenty years.

ADDS TO USE OF AIR MOTOR.

Drilling and reaming by pneumatic power may now be done in places where it is impossible to work an air motor. This is made possible by the Air Motor Auxiliary, the invention of Joseph A. Humphries, gang foreman of the Chicago Belt Railway. The accompanying illustration shows the appliance in position, and properly connected to an air motor, for drilling out a jaw bolt of a locomotive. The auxiliary may also be successfully applied in drilling out from bolts through the frame and cylinder wall, beneath the saddle casting.

The Railway Master Mechanic, a well known authority, says: "An improvement on this device would be the application of



Air Motor Auxiliary

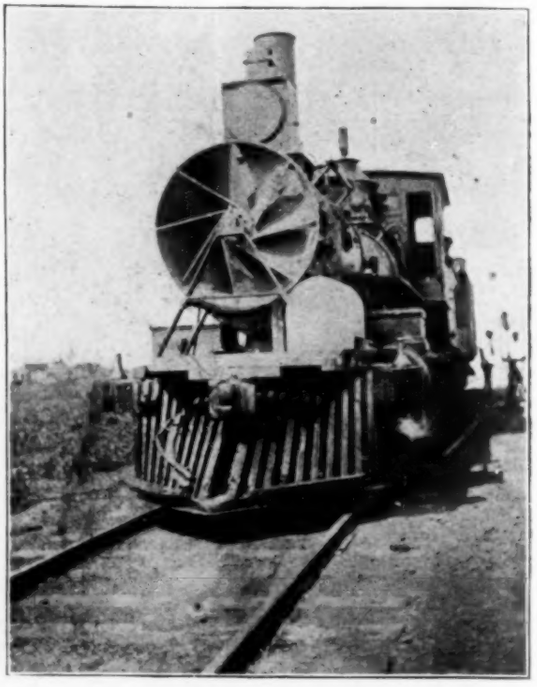
four handles (similar to those used on an air motor) to the set screw for propelling the drill. In the present form of the device this set screw must be turned with a wrench, which is an inconvenience to the operator."

A circular mil is a circle one one-thousandth inch in diameter. A wire one foot long and one circular mil cross-section is called a mil-foot.

TO MAKE THE WIND LIGHT PASSENGER TRAINS.

Pressure of Air Against a Moving Locomotive to Serve An Economical Purpose.

The wind pressure against a moving locomotive, the extent of which has been attested by every person who has ever stuck his head out of the window of a passenger coach in motion,



New System of Electrical Train Lighting

is to be utilized in lighting trains. As previously explained in a brief description of the system in Popular Mechanics, the power is obtained from a "wind mill" or rotary fan attached to the front end of the locomotive. On the same principle as the wind mill is turned by the wind's coming against it, this rotary fan is operated by its going against the wind. This motion generates electricity which lights the train and operates ventilating fans in the coaches. The dynamo is located either on or under the pilot and is connected to the fan by a special device. A storage battery is located on the tender or underneath each car, and so equipped automatically with cut-outs as to properly govern the flow of current from the dynamo to the battery.

The Railway Review says: On a train running 45 miles per hour 4.5 kw. per hour were developed, which is sufficient to charge the storage battery so that it will illuminate a train of five cars seven hours per night and leave the battery with nearly its maximum charge due to the continuous operation of the fan.

ASPHALT STREET NEED NOT BE SLIPPERY.

Street Commissioner Woodbury of New York finds that a deluge of water will not produce a slippery surface if the street be first cleaned of dirt. He has built for cleaning the streets a "suqueegee," a board with a rubber veil, such as sailors have used for generations in cleaning ships' decks, only the commissioner draws his by horses.

A way to determine the approximate horse-power necessary to pump water to a given height is to multiply the total weight of water in pounds by the height in feet and divide by 16,500. This allows for water friction and steam loss.

Queer Life and People on the Texas Border

Scenes in the Mexican Quarters Remind One of a Visit to Another World

A peculiar life, unknown to hustling enterprising Americans of the more populous districts, exists on the border between Mexico and the United States. Here in the Mexican quarters one sees types of persons, modes of living and mechanical devices that might be supposed to belong to another world. The accompanying illustration shows typical faces and scenes such as are met with any day in this section. The wagons, house furniture and implements of agriculture here to be found are of the crudest construction.

Our Mexican Citizens

The houses are called jacales. The skeleton walls are a few stray stick pickets, driven crazily into the ground and covered with old oil cans, wickey-ups of unsavory blankets and the worn out straw of some primeval thatching. "At the door always open," says Dr. C. E. Fisher, a student and writer of border life, "kneel the women at the matat, a primitive corn mill, used in the pounding of torillos, the Mexican Johnny cake; on her knees in front of the matat, the woman mixes her meal, meat, cheese and pepper, and with her stone roller and her deft hands she rolls and pats her delicious edibles into marketable shape. Like her lazy husband, she has found no new ways of shortening labor—wants none. The acequia ditch is well enough for a washtub, a great flat rock suffices for a scrubbing board, and, squatting on a little plank thrown across the ditch, the senora washes her coarse linen in the bright water or on those knees again scrubs her reeking rags on her old-fashioned washboard."

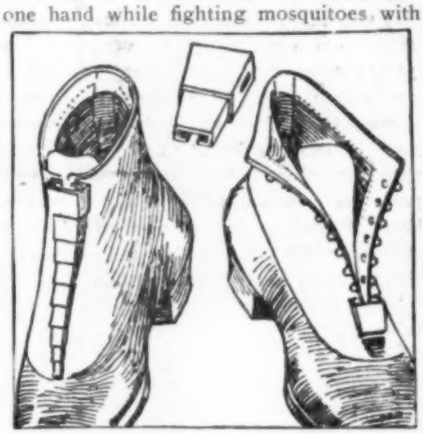
The Iron Mountain Railroad Company is doing commendable work in preserving records of the scenes and conditions of this present day border life, as well as in saving from oblivion the ancient Franciscan missions that are crumbling to dust in this interesting country. This railroad has employed writers and photographers who, with skill becoming their professions, have portrayed the scenes and conditions in San Antonio, and along the border between Texas and Mexico.

DEATH VALLEY'S GREAT BORAX DEPOSITS.

The discovery of the enormous deposits of borax in Death Valley, California, has completely revolutionized the industry and brought millions of dollars to the operators of the borax mines. Originally borax was produced by evaporating the waters of Clear Lake, 80 miles north of San Francisco; next by refining the borax crust on many of the alkaline marshes of eastern California and western Nevada. Now it has been found that the borax crust on the marshes is but a secondary deposit derived from the beds of borate of lime in the tertiary lake sediments in San Bernadino county and Death Valley. Death Valley is 50 miles long and from 5 to 10 miles wide. At its lowest point it is 480 feet below sea level, with mountains towering on either side nearly to the regions of perpetual snow. Death Valley is the hottest place in the United States. The summer temperature often reaches 137 degrees in the shade.

INSTANTANEOUS SHOE FASTENER.

A Jersey City man who found great difficulty in trying to lace his shoe with one hand while fighting mosquitoes with the other has invented a lightning shoe fastener. The cut shows how it works. The fastener draws up with a telescope slide.



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Popular Mechanics is an illustrated weekly review of the mechanical and engineering press of the world, presented in plain, simple language, and condensed as much as possible. We always credit publications from which illustrations and facts are taken. Where the name only of such publication is given, it indicates we have used practically the entire article. Where name of publication with date of issue is printed, we have made only a brief digest, and those of our readers who desire to study all the details of the subject should procure from its publishers, or their local newsdealer, the copy of that date

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THIS ISSUE 17,000 COPIES

Following is the record of new yearly paid subscribers received by POPULAR MECHANICS during the past month.

WEEK ENDING	OCTOBER 25	472
" "	NOVEMBER 1	534
" "	NOVEMBER 8	886
" "	NOVEMBER 15	907
" "	NOVEMBER 22	929

Advertisers are invited to examine our books at any time. We tell the exact truth about our circulation, and have nothing to cover up

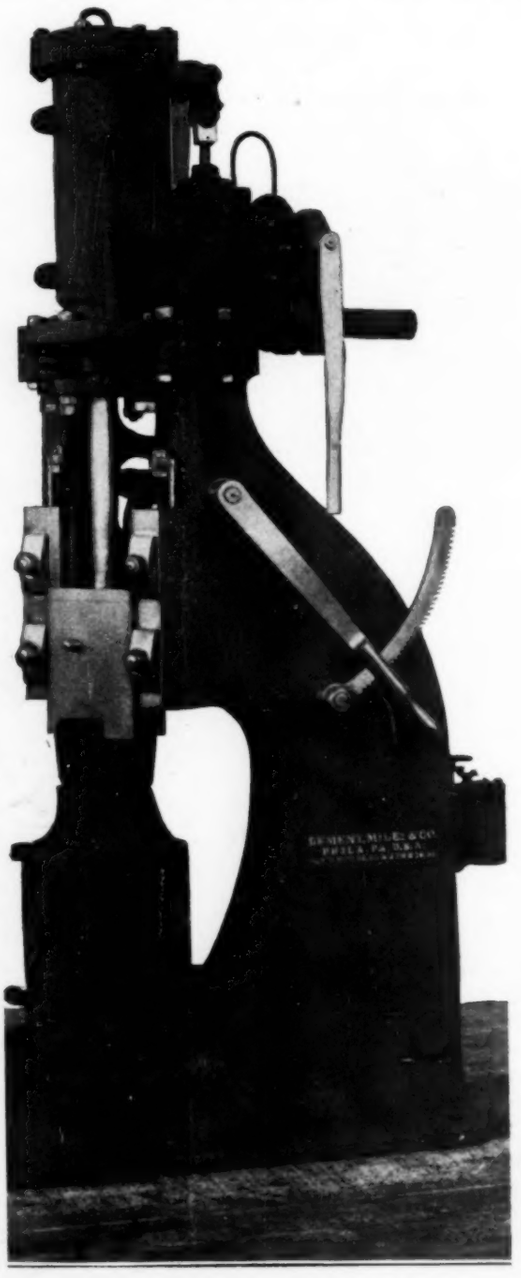
AMERICA'S UNPARALLELED ELEVATOR SYSTEM.

The United States has the greatest system of grain elevators in the world. This is made necessary by the enormous crops, the steady increase of production and the necessity of preserving the grain, when there is not a ready market, until a future time. On a western farm where the harvest field may cover 500 or 2,000 acres, only a small portion of the yield is threshed and placed in the barn bins. The bulk is carried to what are termed railroad elevators, located in convenient towns. These vary in capacity from 10,000 to 100,000 bushels, according to their location in the producing district, and from them the transportation company loads its cars for domestic or foreign markets. But these district elevators represent only a fraction of the space for storage that a cargo may pass through before being loaded on shipboard. The Engineering Magazine says:

"The farmers of the United States to-day are sowing corn fields aggregating over eighty million acres—ten million more than ten years ago and harvesting two billion bushels and over in a season. Their wheat fields cover forty million acres—four million more than in 1890,—and even the oat area is nearly thirty million acres, an increase of 20 per cent. It may be impossible to sell such a crop immediately except at a loss. Therefore the imperative necessity for storage facilities has resulted in the development of the elevator system in America on a scale unknown elsewhere in the world."

TWO HUNDRED AND FIFTY POUND STEAM HAMMER.

The amount of work which can be done in a shop with the smaller types of steam hammer, and the time it will save, is something surprising. The hammer selected for illustration is one made by Bement, Miles & Co., and is known as a 250-



250 Pound Single Frame Steam Hammer

pound single frame steam hammer. These hammers take steam above and below the piston, and strike a blow rated at 250 pounds, but which is really more. The cylinder is 5 inches diameter, with 16-inch stroke, and the usual die surface is 4x7 inches.

There is not a naval power in the world, even the weakest, that does not possess a navy proportionately better officered and manned than ours.—The Chicago Tribune.

In England power gas is generated with Mond generators from slack coal with 60 per cent of carbon. It is claimed that peat would give as good results.

TINY STOVE IS A MARVEL.

Serviceable to Almost Everyone, and is as Low-Priced as It is Small.

A tiny alcohol gas stove that weighs only eight ounces, and gives heat equal to a good-sized cooking stove, has been

Alcohol Gas Stove

placed on the market in Chicago and is easily the novelty of the season. This unique little device, which is one of the most useful and convenient ever patented, comes from Germany and, characteristic of German manufactured products, is wonderfully substantial. While it can be carried in an overcoat pocket, it answers nearly all the purposes of a full-fledged gas stove. It does not burn the alcohol direct, but burns the gas produced from the alcohol and generates its own gas. This causes a wonderful economy of fuel which amounts to less than 1½ cents an hour. For traveling men and women, actresses, bachelors everywhere, for all men who shave themselves, campers, occupants of apartments where light housekeeping is prohibited, hotel roomers, for the sick room and in fact for nearly every calling the little stove fills a big vacuum in our former conveniences and is sure to become exceedingly popular. The stove is already in general use in the camps and hospitals of the German, French, British and American armies. To add to its desirability the device is sold at such a very low price that it is within the reach of everyone and the cost would not be missed by the poorest.

ALARM TURNS ON LIGHTS.

A Plainfield, N. J., man has installed in one of the fire engine houses of that town a device which instantly turns on the electric lights when an alarm is sounded. It can be applied to residences and made to light the house when a burglar tries to open a window or door.

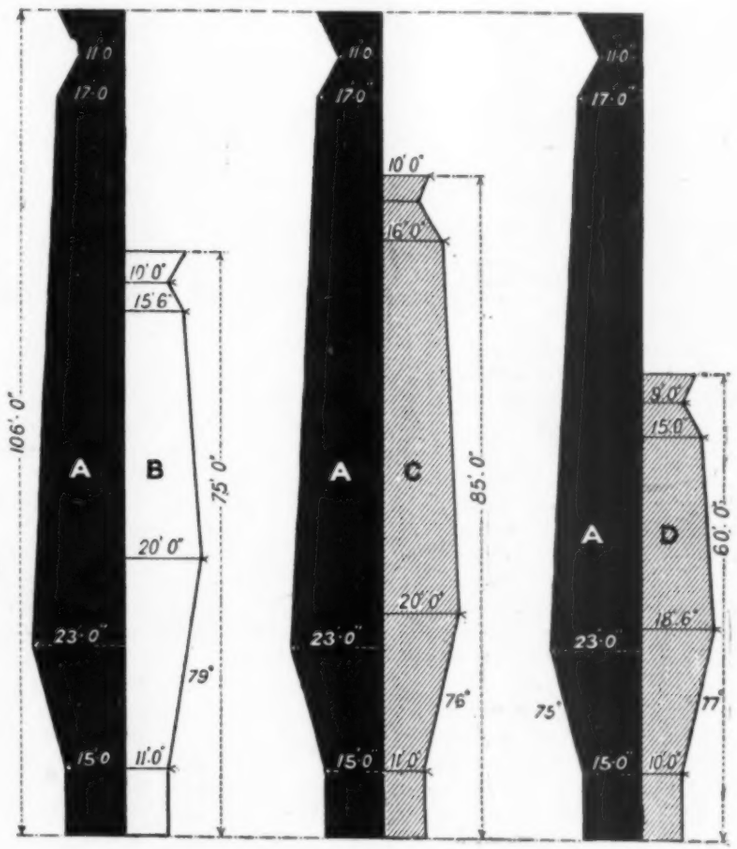
John Bull is making a brave but probably misguided attempt to measure swords with the Standard Oil Company.

American and British Blast Furnaces Compared

America leads the world in her methods of converting the crude ore from the iron mines into steel rails, structural iron and other forms of the manufactured products. During the past 15 years one improved process has followed another almost before the first was in actual operation. Scores of great furnaces costing millions have been torn down and rebuilt in order to secure the advantages of quicker time, larger output and a reduced cost of operation. The English iron manufacturers have been slow to make what seemed an experiment, or to change from long established methods.

The result is that the English are now far behind although there is beginning to be an awakening among them. An illustration is found in the accompanying cut which gives a comparison of the output for one day of a modern American blast furnace and the best English types. Where a good daily average in an English furnace is 90 to 100 tons, the up-to-date American furnace turns out from 500 to 750 tons per day, and the increased output costs little more than one-half more. The internal capacity of a modern British furnace is 18,000 cubic feet; of an American 26,000. Where the English furnace is 85 feet high the American is 106 feet; the English use an air pressure of 7 pounds; we have 15 pounds; English blowers furnish 17,000 cubic feet of air per minute; ours send 50,000 cubic feet roaring through the molten mass. Where they use 1.317 pounds of air per minute, we use 3.815. To prevent the melting of the furnace itself from the enormous amount of oxygen thus supplied, many American furnaces have water jackets through which as many as 7,000,000 gallons of cold water can be pumped in 24 hours.

THE PHYSICAL PROPORTIONS OF AMERICAN AND BRITISH FURNACES COMPARED.



The output of pig-iron per diem of 24 hours. In furnace marked **A** .. 570 tons,
That of **B** .. .. 200 ,,
,, **C** .. .. 206 ,,
,, **D** .. .. 95 ,,

A is the Up-to-date American Furnace. **C** is the Best Type British Furnace.
B ,, Old Type ,, ,, **D** ,, Old Type ,, ,,

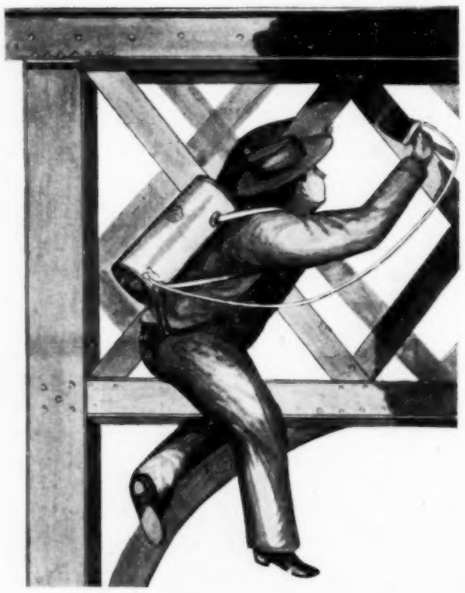
Of 95 graduates of Haskell Indian Institute, Kansas, previous to the classes of 1902, 77 are at work earning their own living and most of them are supporting in a respectable way their own families.

PNEUMATIC PAINTING MACHINE.

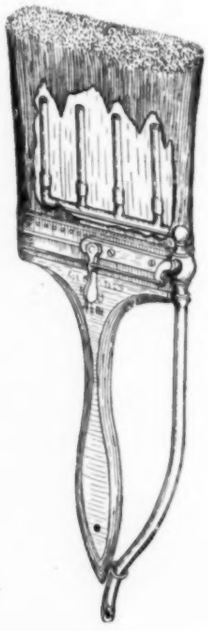
The paint spraying machine which came into general notice at the time the world's fair buildings in Chicago were being finished has proved a valuable invention. By that process paint is squirted in a spray from a nozzle attached to a hose just as a small boy waters the lawn. For rough work, such as temporary buildings, freight cars, etc., it has been found a great economizer. It works best however on soft woods which easily absorb the paint. For the better class of buildings, structural iron, bridges and the like it has not been found desirable.

The illustrations show a new idea in painting which appears to utilize the advantage of constant flow and still permit the use of a brush by hand, which gives that even surface and lasting effect so much desired. The paint is carried in a small tank strapped to the back of the painter, and a small air pump charges the tank with sufficient pressure to insure a steady flow into the brush. This flow can be stopped in an instant by a stop-cock, when the operator wants to rest or change his position. It saves one-third the time which was formerly lost in dipping into a pail, and can be used with any kind of brush. It also leaves the painter with one hand free at all times, and doubles the amount of work one man can do. The apparatus is simple and not expensive.

Painting Outfit



Bridge Work



Brush

TO MAKE GLASS PLATES REVOLVE OPPOSITELY.

Editor Popular Mechanics: How can I safely mount two glass plates upon a steel bar so that they may revolve in opposite directions. They are to be used for a Whimhurst electric machine. The plates are 15 inches in diameter, ¼ inch thick. What size hole must be made in the plates? What size bar must be used, and how should the pulleys be attached to the plates? The plates must not be more than ¼ inch apart. This has been a problem that has bothered me for quite a while and if you solve it for me, you will greatly oblige.

H. G. C., Cleveland, O.

Answer: The steel bar should run through between two bearings. Over the steel bar fit two flanged hubs, loosely so that they may easily revolve. Slip the hub through the hole in the glass plate.

The hole in the hub should be equal in diameter to the diameter of the steel axle. The diameter of the hole in the plate should be equal to the outside diameter of the hub. We would suggest a diameter of ¼ inch for the steel bar and ⅝ inch outside diameter of hub. Instead of cementing the plate to the flanges to support it, it would be better for you to drill through the plate and flanges three small holes and fasten the plates by means of bolts. Vulcanite (hard rubber) plates, however, would be much better for your use than glass. They could be cemented with any good rubber cement.

Over the steel bar between the two hubs are placed two washers. Over each hub and next to each plate on the outside is fastened a small grooved pulley to take the belt. These belts are driven from two larger grooved pulleys upon the crank axle, one of the belts running straight the other crossed. If the plates are not to be more than ¼ inch apart the flange on each hub should be about 3-32 inch thick. The two washers between the hubs should each be about 1-32 inch thick. Take good care that the hubs run easily on the axle but do not fit loosely enough to allow plates to wabble.

BLOWS HIMSELF UP AT SIGHT OF WATER.

Count Ravelli is determined not to meet a watery grave as did so many of the other members of his family. Two sisters, two uncles, a brother and the count's father have all been drowned. The count has therefore invented a remarkable suit of pneumatic garments which he wears all the time when in the vicinity of water. He has a hat which in itself is a life preserver. It looks like an ordinary hat, but by means of a tiny valve, generally out of sight, it can be quickly inflated when it will float like a cork. Not only the hat, but everything worn by the count—his coat, vest, even his shoes and umbrella—is inflatable. Whenever the count sees water he blows into one or more tubes and instantly he swells up to enormous proportions and it would be impossible for him to drown.

More than one thousand officers aside from those that will come from the naval academy are needed to man the new American war vessels.

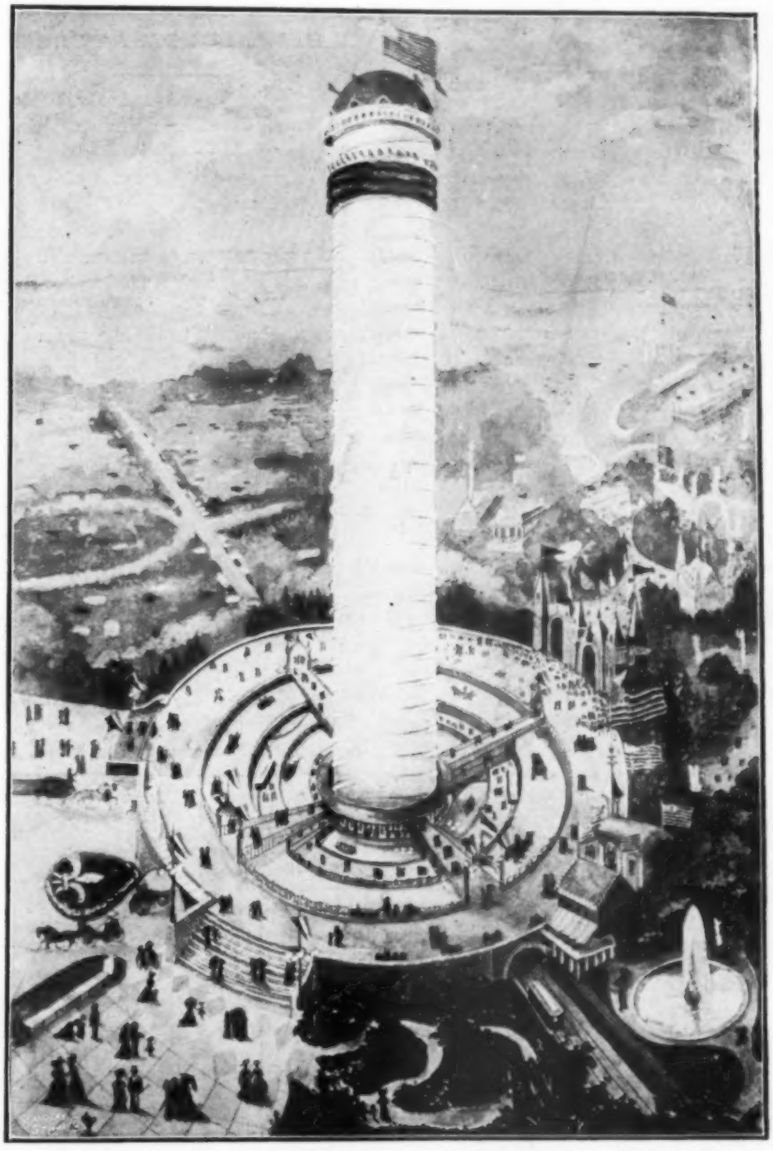
"There will be found no more salable magazine anywhere than Popular Mechanics, and the dealer is a bit behind who does not keep copies on sale."—The Book and News-Dealer.

Proposed Splendid Tower for St. Louis

People of All the World Asked to Build the Grandest Structure of the Kind Ever Attempted

Inhabitants of the world in every nation, civilized and uncivilized, have been called on to build a tower on the World's Fair grounds at St. Louis, that will be a lasting monument to the grandeur of the exposition and the most magnificent tower ever built. For this purpose a company has been organized, known as the Crystal Palace Tower Co.—of which Norton W. Bowman is president and which has its headquarters in St. Louis. The scope of vastness and grandeur the plans comprehend are almost bewildering to the human conception. Towering to the dizzy height of 1,050 feet the great steel column, 565 feet around, will be crowned by an Acropolis containing the only exhibition of a wireless telegraph station in the world. Over this will float the largest flag staff ever made. Here too at this sky-piercing altitude will be an observatory that will have a capacity of 7,000 visitors at one time. This observatory in the clouds will be reached by inside elevators and by an endless palace excursion car, encircling the outside of the column, which will wind its way heavenward from the base by means of 114 sidewheels traversing a series of spiral railway tracks affixed to the outer walls of the column. In the accompanying illustration the car may be seen encircling the tower near the top on its way to the observatory. The motive power is to be furnished by compressed air machinery. The car is three stories high and will seat 800 people. But grandest of all will be the crystal light effect from which the construction derives its name, "The Crystal Palace Tower." A veritable crystal palace of light will be produced within the column by the suspension of millions of cut glass crystals, strung on wires suspended from the top of the tower and curtaining the entire inner surface of the column with a network of reflecting surfaces upon which a flood of vari-colored electric lights will be precipitated. The crystals will be in constant agitation and the marvelous blending of the myriad rays of mellow light will reflect all the tints of the rainbow.

A lagoon will surround the base landing of the palace car and here is to be a reproduction of ocean bathing. The bottom will be laid with salt blocks and high billows will result from a mechanical wave-producer. Other features of the structure will be the largest photograph gallery in the world, located in the Acropolis; a promenade street car and automobile landing; a grand boulevard above the street car landing; an arena for games, bicycle and automobile races; a terraced grand promenade just above the grand boulevard, from which the numerous attractions about may be viewed. After the fair the tower is to be remodeled to form a permanent exposition.



To be the World's Greatest Tower

ITALY'S SANITATION INCREASES POPULATION.

Improvement in public sanitation and the consequent lessening of infant mortality has worked a wonderful and surprising influence on Italy's population. During the past 20 years Italy has lost at least 5,000,000 people by emigration. Yet the last census shows an increase of population that no one expected. The country's male population which was estimated at 31,000,000 turns out to be 35,000,000. The ratio of increase is about four-fifths of one per cent a year. The increase since the last census, 1881, is nearly 7,000,000, or 25 per cent. Domestic Engineering says:

"It may not be generally known that the Italian medical schools are among the best in the world, and that the Italians have developed a singular capacity for hospital organization and management. The government has also undertaken great movements for sanitary reform, by introducing a good water supply, closing the old wells and flushing the streets. Naples was raised in 20 years from the position of one of the world's unhealthiest cities to one of the healthiest, and the case of Naples is said to be typical of what is happening throughout Italy."

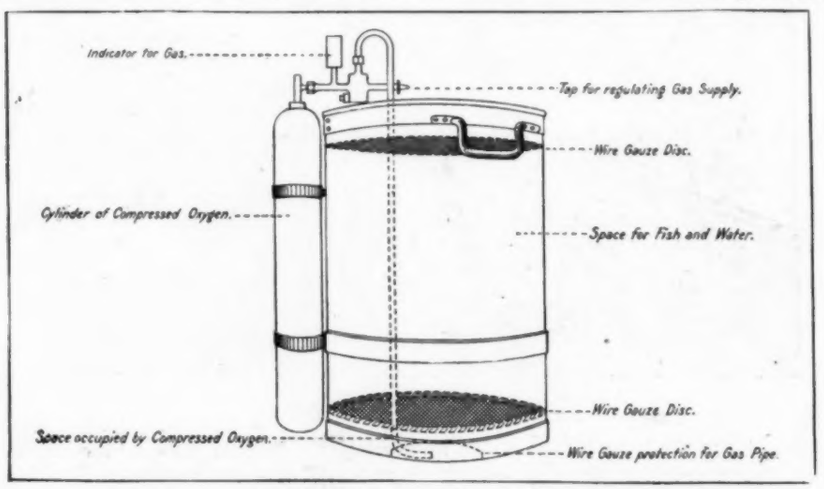
The esteemed W. C. T. U. doesn't like the word genuine; thinks "genuwater" would be better.

DEVICE FOR CARRYING LIVE FISH.

By Henry M. Morgan, United States Consul at Lucerne, Switzerland.

Large quantities of brook trout and other fish are being sent from Switzerland to other parts of Europe by means of a device that has been patented by Gmur, Maurier & Wright of Lucerne. The mechanism of the contrivance is as follows:

There is a cylinder attached which is charged with compressed oxygen and automatically allows the required amount of gas to descend, by means of a tube, under a very fine wire gauze, which is a little above the bottom of the barrel or cask. The pressure of the oxygen keeps the water from entering the space between the screen and the bottom of the barrel, and allows only a small portion of the oxygen to penetrate at a time. The gradual escape into this space is greater than the outlet through the wire gauze, with the result that when the space becomes greatly charged with oxygen gas, and the force of the water above is no longer able to hold it, it rushes into the tank or barrel with such force that the fish are turned over and over. The most delicate fish can be packed in these tanks in great quantities and will keep alive for thirty-six hours with the present device; but it is expected that with a larger cylinder of oxygen, the length of time will be increased. Shell fish and eels could be packed like sardines in a tin. As the cylinder containing the compressed oxygen gas works automatically, no care is required during the transportation of the casks.


Indicator for Gas.
Tap for regulating Gas Supply.
Wire Gauze Disc.
Cylinder of Compressed Oxygen.
Space for Fish and Water.
Wire Gauze Disc.
Space occupied by Compressed Oxygen.
Wire Gauze protection for Gas Pipe.

Contrivance for Transporting Fish Alive

REMAINS OF MOUND BUILDERS.

The remains of two mound builders were recently exhumed by L. L. Emmons while excavating in one of the numerous mounds near Albany, Ill. The skeletons are supposed to be male and female. They were found on a level with the surface of the earth, the mound being built over them. The skeleton of the female fell to pieces when exposed to the air. The skull, ankle bones and other parts of the skeleton of the male were found to be perfectly preserved, and the skull has been placed on exhibition. With the remains numerous stone implements and utensils were found.

MAKES THE DEAF TO HEAR.

Earphone Conveys Sound To Those Who Never Heard the Human Voice.

The Earphone is the name of a new and remarkable invention that conveys hearing to those who have never heard the sound of human voice before. The device was tested and approved by the Pennsylvania Institution for the Deaf and Dumb at Mount Airy. Those who have suffered deafness through contagious fevers were the only ones that could not be made to hear plainly. The device is the result of the combined efforts of several brilliant minds who have given the subject many years of close application and scientific study.

The principle of the Earphone is similar to that of the telephone. It intensifies sound while making articulation so distinct as to enable those that have been born deaf to hear. The invention is a transmitter battery and receiver. The earpiece or receiver is about the size of a dollar and as thick as an ordinary hunting case watch. The transmitter is practically the same size. The battery which excites the sound waves is very compact, weighing but three ounces. The Earphone, however, is but a teacher for the deaf mute. To him the pronunciation of the words is unintelligible—the sounds he hears have no meaning.

A rush to Death Valley, Cal., has been caused by the announcement of the discovery there of rich deposits of nitre.

HOW BAKERS' BREAD IS BAKED.

Human hands play but an insignificant part in baking bread these days in comparison to what they did in former times. Now the flour and water is mixed by machinery, the dough is kneaded by machinery, flattened out by machinery, molded into proper shape by machinery, and by machinery hauled to and from the great mechanical ovens, where the degree of heat, time of baking, etc., are all automatically recorded. The result is there is never a failure in baking bread at the modern bakery. Fig. 1 shows a baker's mixer of late design, made by F. Westerman & Co. The dough is placed in the hopper and after being thoroughly worked by the interior mechanism is run through the machine shown in Fig. 2. This flattens out the dough into a continuous layer. This layer passes through another machine, which chops it into the proper size for loaves, after which it goes into the oven. In baking rolls, cakes and the like, the dough is formed into shape by the use of a system of molds.

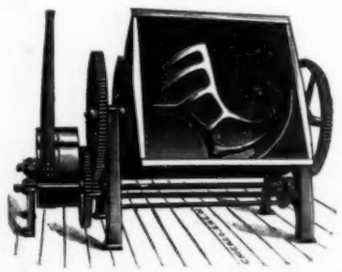


Fig. 1. The Mixer

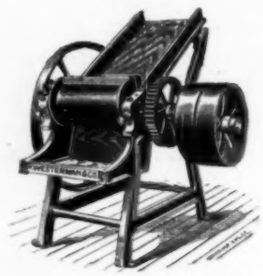


Fig. 2. For Flattening Out the Dough

VANDERBILT TO DUPLICATE ASTOR'S GENEROSITY.

John Jacob Astor's gift to the public of his turbine engine inventions will soon be followed by other similar exhibitions of generosity. Cornelius Vanderbilt, it is said, is to turn over to the railroad branches of the Young Men's Christian Association, established by his father, all the profits derived from the use of his improved engine tender and locomotive firebox. The railway Young Men's Christion Association buildings in New York and along the New York Central are all well equipped and cost the late Cornelius Vanderbilt a fortune.

AGED INDIAN WOMAN BUILDING A CANOE.

Kil-so-quah, an Indian Squaw, living near Roanoke, Ind., is just at present busily engaged in finishing a bark canoe. She is 91 years old and is probably the oldest Indian living east of the Mississippi river, yet she is in entire possession of all her faculties, and is as bright and active as she was 30 years ago. She does not speak English and conversation must be carried on through an interpreter. Kil-so-quah lives alone in her wigwam made by her own hands 18 years ago. It is built of bark firmly attached to a framework of poles with strips of pliable wood and is a good protection from the weather. Kil-so-quah's hair is jet black, her eyes glisten like beads and her dress is remarkable for the inclination to bright colors shown by the aged squaw. She loves to tell of her presence at the signing of the Miami treaty of 1829 with the government at the old Hanna springs, now in the city limits of Wabash, and recalls vividly the terror of the Indians on that occasion when the military bands began to play.

LOSS IN COINING GOLD—PROFIT IN PENNIES.

A strange thing about our coining system, the Draftsman says, is that the government loses money in coining gold but makes a big profit in coining pennies. For instance in a $10 gold piece there is exactly $10 worth of gold and 10 per cent of copper put in to harden the precious metal, besides the cost of minting. A silver piece of money is about half profit, but the penny pays Uncle Sam best of all, as the blanks are purchased at the rate of $7,300 per million. That is, the United States government obtains for 7 and 3-10 cents the copper blanks which by the process of stamping are transformed into $1 worth of pennies.

PORTO RICO'S BEAST OF BURDEN.

Ox Does Nearly All Work Done by the American Horse.

In slow, easy-going Porto Rico, oxen take the place of horses in the United States. There, in predicting future conditions, they tell of when the horse will supplant the ox; and never of the day when the motor vehicle will supplant the horse, as they do in the United States. In Porto Rico oxen yoked together pull the great loads of sugar cane from the fields, carry loads of Guinea and Malojillo grasses, which for feeding purposes is probably the equal of Kentucky blue grass, and draw the plow on the farms. The ox does practically all the heavy hauling both in country and in town. The cattle are not primarily dairy cattle. The main effort in their breeding, where there has been any effort, has been toward better working animals. In the warm climate sheds are deemed unnecessary except for calves, and there is never scarcity of food in the grasses that grow exceedingly prolific throughout the year.

A Load of Grass—From R. A. Pearson, U. S. Dept. of Agriculture

Yoke of Oxen and Cart—From R. A. Pearson, U. S. Dept. of Agriculture

Plowing with Oxen—From R. A. Pearson, U. S. Dept. of Agriculture

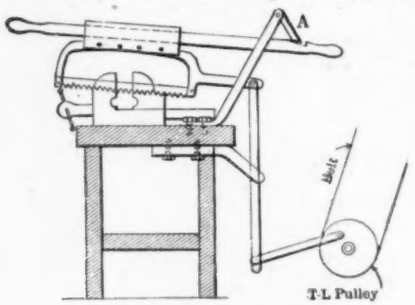
GROWING OF WALKING CANES.

Growing of walking canes is quite an industry in parts of America and Europe. This fact is not known to many who imagine their canes, with the crooked handles, were found just that way growing wild in the woods. Indeed there are farmers who devote their entire energies to the raising and proper culture of walking stalks. At any store where canes are sold one may find many of them of precisely the same length, weight, shape and material. Canes having a tangle of roots at the handle are much sold in England. They are grown by a "farmer" who has made a fortune trimming and shaping the young ash plants. In some cases the canes are secured by grubbing and pruning furze and wild shrubbery and the men who engage in this occupation are said to make money out of wild stuff that goes to waste in many other places. The furze is not cultivated, though it might be to a profit, especially on areas that are good for little else.

SHOP NOTES

A HOME-MADE POWER HACKSAW.

I send a sketch of a home-made power hacksaw; it is not very pretty, but it gets there just the same, writes a correspondent to the American Machinist. There is not much machine work about it, as can be seen. It is secured to an ordinary machinist's bench and all the parts are made



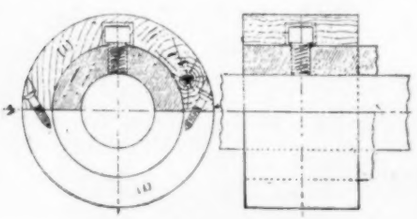
HOME-MADE POWER HACKSAW.

from stock wrought iron, with the exception of the slide which is brass riveted to the blade frame. For holding the work an ordinary vise is used. The saw is not automatic, but a simple stop at A prevents the saw dropping after cutting through the work. When the apprentice has nothing to do, this is a good thing for practice.

WOODEN SET SCREW PROTECTOR.

We recently told how to protect a set screw on exposed shafting by covering with tin. Here is another scheme devised by a correspondent of the American Miller, who says:

All that is needed to make this protector is a keyhole saw, a brace, bit, screw driver and two screws. Take a piece of



poplar wood 1½ or 2 inches thick and cut out the rim, 1, that will just fit on the collar; saw the rim in two at 2; bore a hole for the set screw head and then fasten the protector together with screws. This can be dressed up on the outside, while running, with a piece of sand paper and made perfectly smooth.

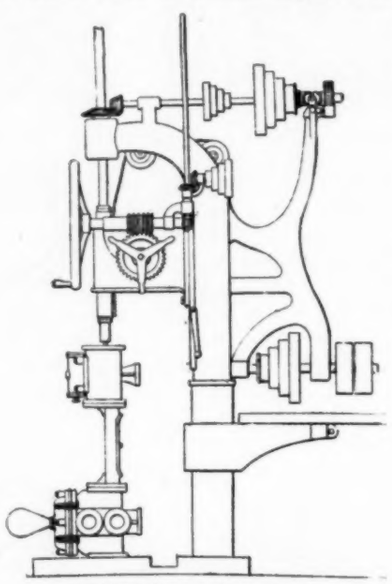
"Knock the other man down and get it all," has been superseded as a maxim of business policy by "get together and share up."

CURIOSITIES OF HEAT.

The thermometer marks the temperature, but the bulb of quick silver and the human body are affected differently. As to what feels hot or cold to one is a matter of conduction of heat. Silver, iron, wood and air at the same temperature feel differently. Silver will burn the skin at 156 degrees Fahr. It will blister the tongue at 150 degrees Fahr. Iron to do that would have to be considerably hotter. Wood can be handled when at a temperature of 200 degrees Fahr., and it is on record that men have stood an oven heat of 600 degrees Fahr. for a short time without apparent injury.

REPAIRING A STEAM PUMP.

In many steam plants old steam pumps are found which have been discarded be-



REPAIRING A STEAM PUMP.

cause they are worn out. The accompanying illustration, taken from Science and Industry, shows how an enterprising engineer and machinist bored out the steam cylinder of one of these, and made it as good as new. He did not have a lathe large enough to admit it, so he turned it on one end, and put it under the drill press which was fitted with a power feed attachment. The supplemental steam cylinder, also the water cylinder, was rebored in the same way. If this plan is tried it is well to be sure that the feed will carry the cutters down far enough to go entirely through the cylinder.

Those flighty parlor matches can never be depended on. They lose their heads so easily.

PRACTICAL MECHANICAL MOVEMENTS.

Every mechanic or inventor should study to avoid clumsiness in the construction of his model or machine and so arrange the several parts as to produce the result desired with the least number of parts possible. He should, therefore, be very careful to select as far as possible the simplest and best forms of mechanical movements. For this purpose that interesting magazine, Enterprise, San Francisco, has compiled in a compact manner a large number of the most practical, simple, and inexpensive mechanical movements such as are most generally used in all classes of machines. Among them the mechanic or the inventor may find at a glance just such a movement as is best suited for his purpose, and may find the several parts best adapted for any special combination of mechanism. The following is a brief description of the various movements as numbered:

1. Pulleys with a belt passing thereover.
2. The ordinary sliding clutch and pinions.
3. Means for imparting a jumping motion to a horizontal arm. A cam secured to a cog wheel alternately lifts and drops said arm.
4. Elliptical spur-gear for securing variable speed.
5. Beveled gears.
6. Means for imparting an alternate rectilinear motion to a rack-rod by a continuously rotated mutilated gear.
7. Means for transmitting motion from one shaft to another, said shafts being in the same plane but at right angles to each other.
8. Pulleys for lifting weights.
9. An eccentric upon a revolving shaft adapted to impart a reciprocating movement to a yoke strap.
10. Two forms of universal joints.
11. Differential gears. The inner and outer gears move in opposite directions at different speeds.
12. Different kinds of gear for transmitting rotary motion from one shaft to another arranged obliquely thereto.
13. Means for imparting a partial revolution to a ratchet-wheel at the completion of each revolution of the main wheel.
14. A tilt-hammer. The wiper-wheel lifts the hammer four times each revolution.
15. Means whereby a reciprocating rectilinear motion of a vertical rod transmits an intermittent circular motion to a toothed wheel.
16. An ordinary sliding clutch and pinions.
17. Sun and Planet motion. The outer gear is fixed to the connecting link and moves around the axis of the fly wheel.
18. Means whereby the reciprocating

motion of a jointed rod produces an almost continuous rotary movement of the ratchet-face wheel.

19. Gearing for transmitting a continuous rotary motion to a vertical shaft from a horizontal shaft, by the alternate revolution of gears upon said horizontal shaft. These gears are loose upon their shaft, and have ratchets which are engaged by pawls fixed to the shaft.

20. Means for transmitting rotary motion from one shaft to another at right angles thereto.

21. Multiple gearing. The triangular wheel drives the large one.

22. A simple ore stamper or pulverizer. The plunger is raised and dropped twice for each revolution of the shaft.

23. Variable rotary motion produced by uniform rotary motion.

24. Ordinary crank-motion.

25. Air pump; piston motion. The racks are moved in opposite directions by the revolution of the gear.

26. Crank motion. The wrist-pin upon the disk works within the slotted yoke.

27. Centrifugal governor for steam engines, etc.

28. A lower fixed rack having a gear mounted thereon and meshing with an upper movable rack. As the pitman secured to the gear reciprocates, said gear revolves and imparts a movement to the upper rack which is double that of the gear.

29. Means for imparting a reciprocating rectilinear motion to an upright rod by rotating an upright shaft having an oblique disk secured thereto.

30. A heart-shaped groove engaged by a lever, is adapted to impart an irregular swinging motion to said lever.

31. A triple cam adapted to lift the rod three times at each revolution of the disk to which said cam is secured.

32. Means for producing a uniform reciprocating rectilinear motion by the rotary motion of a grooved cam.

33. A carpenter's bench clamp. By pressing a strip against the crossed ends of the dogs, the rounded heads thereof will clamp said strip.

34. Means whereby a reciprocating motion is imparted to a frame by a continuously rotating shaft. This shaft has three wipers adapted to contact with inwardly extending arms within the frame.

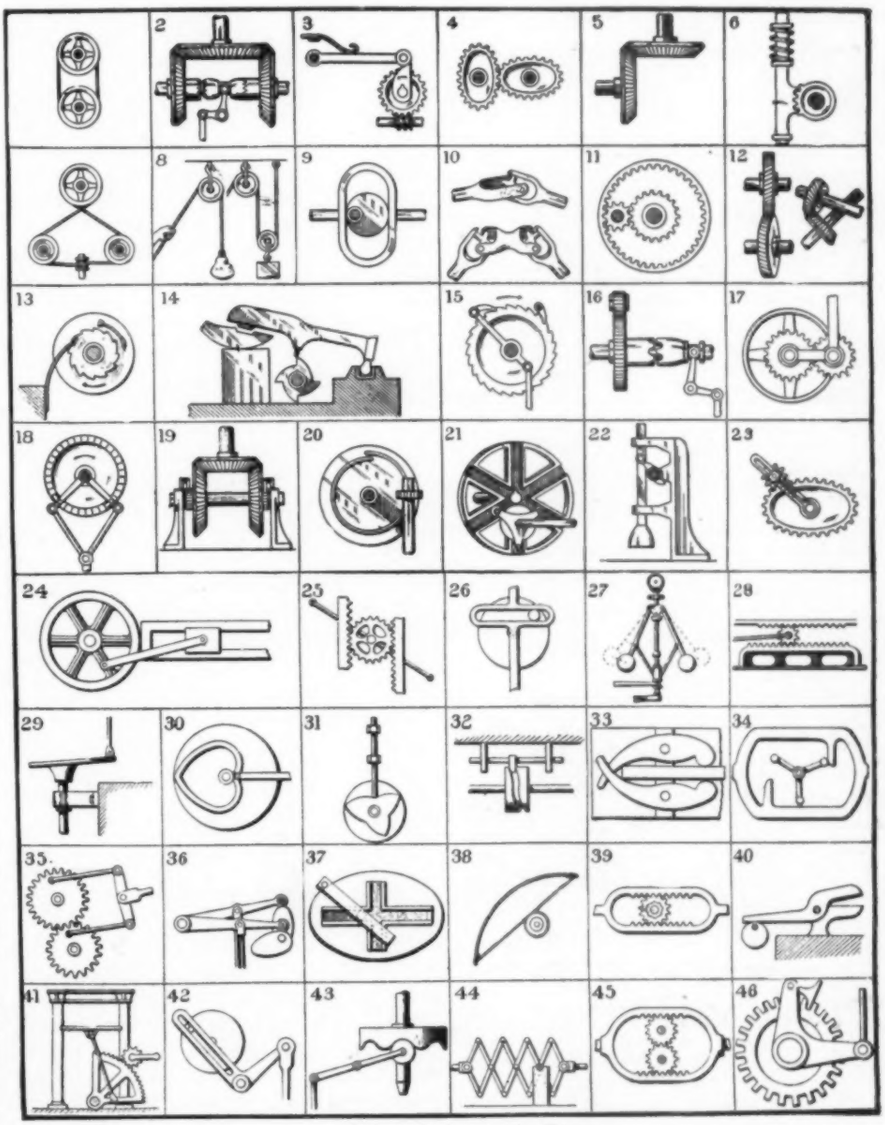
35. Means whereby the rotation of two spur gears having crank wrists produces variable alternating traverse of a horizontal bar.

36. Means for converting uniform circular motion into alternating motion. Cams are mounted upon a revolving shaft and alternately lift and drop levers to which are attached rods.

37. An ellipsograph. By attaching a pencil or other instrument to the cross-bar ellipses may be readily drawn. Studs upon the bar engage the grooves.

38. A fiddle-drill. A strap is secured between the ends of a bow and encircles a shaft or drill which is revolved by the back and forth motion of the bow.

39. A crank substitute. Two loose pinions with reverse ratchets are attached to the shaft, with pawls on the pinion ratchets. Each rack meshes with the reverse pinion for continual motion of the shaft.



Practical Mechanical Movements

40. Metal shears. The arm of the moving blade is raised and lowered by the revolution of the cam.

41. A vertically movable presser platen. This platen is secured by a rod to a toothed sector pivoted within a frame and which receives motion from a small pinion meshing therewith.

42. Means for converting circular motion into variable alternating rectilinear motion. A wrist-pin upon a revolving disk works within a slotted lever.

43. Means for converting circular into rectilinear motion. A waved wheel mounted upon a rotary shaft rocks a lever upon its fulcrum.

44. "Lazy tongs." A system of crossed levers pivoted together by which the amount of a rectilinear motion is increased by the proportional number of sections in the tongs.

45. A rack adapted to receive rectilinear motion by the rotary motion of toothed wheels meshing therewith.

46. Means for converting reciprocating rectilinear motion into intermittent circular motion.

(To be continued.)

"Hitting the pipes" and "going to bed" may soon become synonymous terms. D. L. Riswick of Bellefontaine, O., has devised a series of hot water pipes running under and around the bed, from a tank heated by a small lamp, as a means of doing away with cold feet during the winter.

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KRUPP, "THE CANNON KING," A PEACEMAKER.

His Powerful Guns Made Men Dread War, Rather Than Court It.

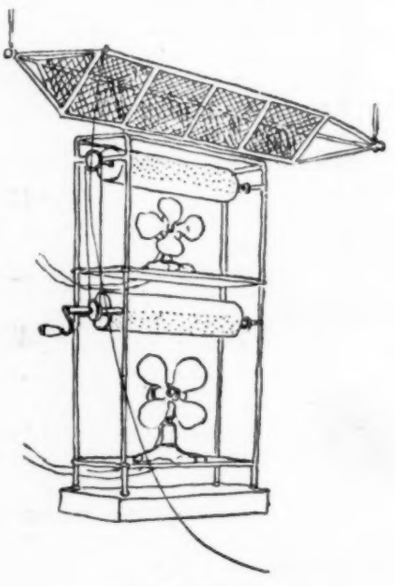
Frederich Alfred Krupp, the "cannon king of Essen," is dead. He was called great because he was the most skilled of any other man in the manufacture of implements to cause death. Yet, strange to say, the results of his skill have been rather to diminish the number of deaths from war than to increase them, and Herr Krupp was more of a peacemaker than an inciter of wars.

In days past a nation possessing a means for the manufacture of such superior weapons would have been the most powerful nation and would have presumed upon the advantage by making war on and conquering inferior nations and the Krupp guns of Germany would have shed blood enough to fill the rivers of all the lands. But it was not Germany alone but all the great powers that benefitted from the excellence of the Krupp works. They supplied 35 governments with implements of war. They made the fortifications of all so strong as to lessen the disposition to encroach on the nation possessing such fortifications. The Krupp works are located in Germany but their output has been for the benefit of all who have the money to buy. These great guns, like the eagle's claws, have had a tendency to ward off attacks of unfriendly powers and they might well be called "peace makers."

The Krupp works at Essen at the time of the death of Herr Krupp had become the model industrial plant of the world. The plant was established by the original Frederich Krupp. It was his son Alfred that made the Krupp gun famous in every land. The late Herr Krupp carried forward the great work in accordance with the traditions of his father and brought the great works to their present unparelleled standard of excellency. The town of Essen has been called the little kingdom of Krupp. It is the home of 150,000 people supported by the Krupp factories which employ 50,000 men. The buildings were planned and built by the Krupp interests. They were called the "model houses." They were superbly comfortable and artistic; the streets were so well paved and the sanitation so perfect as to make the town a source of wonderment to all visitors. Herr Krupp put into effect a co-operative system by which the workmen received a certain percentage of the yearly profits. He provided excellent schools and beautifulful parks and play grounds for the children. He established a system of pensions for superannuated workmen. There were so strikes, no strife between workmen and employers. All worked in harmony and for one common interest.

MACHINE FOR MAKING SNOW STORMS

We may now see snow winding and twisting on the stage with all the realism that it appears in the Northern blizzard. A machine for producing snow storms has just been patented by a well known theatrical man which is said to be the most perfect device of the kind ever invented. The apparatus consists, first of a long triangular framework covered with wire netting on a fine mesh. This box is suspended by ropes at each end and is filled with five or six barrels of paper snow at a cost of $75. The box is kept rocking by a stage hand who pulls at a rope attached to its top and the paper snow filters down through the meshes of the wire netting. But the most important part of the snow storm machine consists of a couple of cast iron cylinders, which



Patent Snow Machine

are perforated with fine pin holes and which are kept constantly revolving. These cylinders are filled with fine salt and are mounted at four and at eight feet above the stage in an iron framework. Just beneath each of the cylinders an enormous revolving electric fan is fixed. These fans strike both the salt and the paper snow as they fall in front of them and send them in a whirling, blinding, cloud across the stage. To add the last touch of realism, when the blizzard is on, the wind machine, a huge wheel scraping against a fixed covering of silk, is rapidly revolved, throwing out a screech which almost exactly simulates that of a blustering wind.

Mark Twain records a case of a German who was brought to the hospital and operated upon. The surgeons at first thought he had swallowed a musical box, but when they opened him they found instead that a long German word had stuck in his throat.

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ARMATURE BUILT FROM IRON WASHERS.

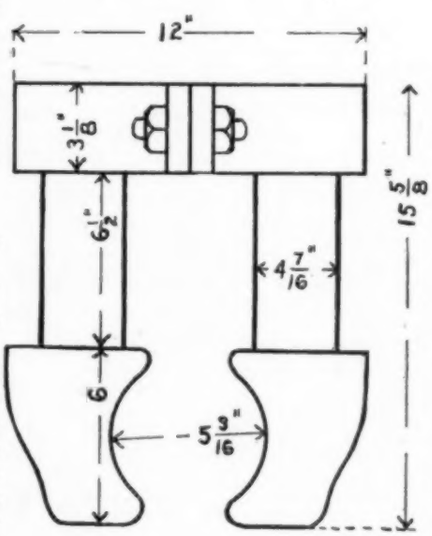
To the Editor:—I made an armature for a motor out of 4½-inch wrought iron washers, 2⅛-inch hole, divided into 32 sections. It is 8 inches long. Please give me through Popular Mechanics the dimensions of cast iron field magnets, bipolar horseshoe type. Also size and amount of wire on fields, and what the power of the motor should be on 110-volt current?

J. H. S., Las Gatas, Cal.

ARMATURE:—This will require about eight pounds of No. 16 double cotton covered magnet wire. Each coil consists of six turns. Each turn is made up of two No. 16 wires wound side by side and connected in parallel. Each coil then consists of two layers of six wires each, or twelve conductors in all. But since there are two conductors in parallel, there are actually but six turns per coil. As the armature is drum wound, of course the finished armature will have four layers of wire upon it, owing to the overlapping of the coils.

FIELD COILS:—This will require about 25 pounds of No. 20 double cotton covered magnet wire. It is arranged in 16 layers of approximately 132 turns each. Allowance was made in the calculation for split wooden spools to be slipped upon the iron cores.

POWER OF MOTOR:—The motor will take about 2½ horse power when



running at its maximum load, and will give out about 2 horse power at a speed of 1,800 revolutions per minute.

The field magnet measures 8 inches in length, parallel to the shaft.

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